



Date of Application and filing Complete

Specification: May 12, 1954

No. 3866/54

Application made in United States of America on June 1, 1953.

Complete Specification Published: June 20, 1956.

Index at acceptance:—Class 81(1), E1A(6:17).

COMPLETE SPECIFICATION

Improvements in or relating to Iodine Complexes

We, ROHM & HAAS COMPANY, a Corporation organised under the Laws of the State of Delaware, United States of America, of 222, West Washington Square, Philadelphia, 5, Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns aqueous solutions of complexes of iodine and soluble salts of condensates of sulfonated naphthalene and formaldehyde. The complexes are powerful bactericides and are useful as disinfectants.

While the disinfecting action of iodine has long been recognised, practical difficulties have limited its application. Efforts have been directed toward providing suitable vehicles and toward obviating or lessening some of the rather objectionable properties of this element.

It has now been found that iodine can be made available as a complex in a form which possesses many advantages as to irritation, staining, stability, and effectiveness. This complex is formed by dissolving iodine in an aqueous solution of a soluble salt of a condensate of sulfonated naphthalene and formaldehyde. The solution may contain from 10% to 60% of the salt, a range of 40% to 55% being preferred. The iodine taken up may vary from 5% to 25% of the weight of the salt.

These compositions are formed by mixing iodine and an aqueous solution of a said salt. The usual temperature of mixing is between 20° and 40°C. Iodine and solution are brought together and the mixture is agitated until a required amount of iodine has dissolved. Undissolved iodine can be filtered off.

Sulfonated naphthalene-formaldehyde condensates are known. They may be prepared, for example, by heating naphthalene and

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sulfuric acid in equal weights, cooling the reaction mixture, diluting it with water, reacting with formaldehyde, and heating until the reaction gives a product of good dispersing action. This product is treated with an alkali metal base or calcium or magnesium hydroxide to give a salt. This is not a wetting agent or detergent, but an effective dispersing agent for various solids. It has now been found that it is a remarkably effective agent for forming complexes with elemental iodine.

Typical preparations of iodine complexes are shown in the following illustrative examples wherein parts are by weight.

EXAMPLE 1.

There are mixed for 24 hours at room temperature 4.6 parts of crystalline iodine and 200 parts of an aqueous 20% solution of sodium naphthalene sulfonate-formaldehyde condensate. The product is a brownish solution.

This solution is evaluated by the Cantor-Shelanski method (*Soap and Sanitary Chemicals*, Volume 27, page 133, February 1951) at 70 a level of 200 p.p.m. of iodine, 1% of whole milk being used as an organic contaminant and *Salmonella typhosa* as the test organism. There is no survival of the test organism during five increments. Nine increments can be added before 100% survival is reached. Yet there is no survival when the entire inoculum is added at once.

EXAMPLE 2.

There are mixed for 24 hours at about 80 30°C. 5.4 parts of iodine and 100 parts of an aqueous 40% solution of sodium naphthalene sulfonate-formaldehyde. A brown solution forms.

By the Cantor-Shelanski test with *Salmonella typhosa* as the test organism and the composition diluted with water to 200 p.p.m. of iodine, there is no survival of this organism up to the sixth increment. The number of increments until there is 90

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100% survival is nine. The aqueous solution of iodine and sulfonated naphthalene-formaldehyde condensate is thus shown to be a highly effective germicide even in the presence of organic contaminants. Its effectiveness is unaltered by hard water.

Other solutions may be prepared in the same way with smaller or larger proportions of iodine and at smaller or larger concentrations of the sulfonate-formaldehyde condensate. The solutions formed are all peculiarly active and efficient as bactericides. They are low in odor, of excellent stability, and of minimum irritation. They have exceptionally low mammalian toxicity. The use-solutions are practically free from corrosive properties. Furthermore, the naphthalene sulfonate-formaldehyde condensates for preparing these solutions are low in cost. In applications where excessive foam is troublesome or undesirable, the solutions of this invention are particularly advantageous.

They are useful for sanitising milking machines and other dairy equipment, for sanitising food handling utensils and eating equipment, for disinfecting premises, for controlling bacterial, fungal and algal growth

in apparatus for circulating water and brines and for disinfecting swimming pools.

What we claim is:

1. An aqueous solution of a water-soluble salt of condensate of sulfonated naphthalene and formaldehyde having iodine dissolved therein.

2. An aqueous solution containing between 35 10% and 60% of a sodium naphthalene sulfonate-formaldehyde condensate and having iodine dissolved therein in an amount of 50% to 25% of the weight of said condensate.

3. An aqueous solution according to Claim 2, containing between 40% and 55% by weight of said sodium sulfonate condensate.

4. An aqueous solution of a water-soluble salt of condensate of sulfonated naphthalene and formaldehyde having iodine dissolved therein substantially as hereinbefore described with reference to the examples.

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Printed for Her Majesty's Stationery Office by Wickes & Andrews, Ltd., E.C.4. 684/2.—1956.
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